

KEYWORDS

Elements in period 3 (single atoms)

Element	Na, Mg, Al	Si	S, P, Cl, Ar
Structure	Metallic structure	Giant covalent structure	Simple covalent molecule
IMF	Strong metallic bond	Strong covalent bond	Weak van der Waals force
Factors (if comparing elements from the same category)	Valence electron increase, metallic bond is stronger		Molar mass increase, van der Waals force is stronger Molar mass: $\text{Ar} < \text{Cl}_2 < \text{P}_4 < \text{S}_8$

Explain the following observation:

a) Al has higher melting point than Ar

Answer:

- Al is metallic structure / giant covalent structure / simple covalent molecule
- Ar is metallic structure / giant covalent structure / simple covalent molecule
- Al has strong metallic bond / strong covalent bond / weak van der Waals forces
- Ar has strong metallic bond / strong covalent bond / weak van der Waals forces

b) Mg has higher melting point than Na

Answer:

- Na and Mg are metallic structure / giant covalent structure / simple covalent molecule
- Na has stronger / weaker metallic bond because Na has more / less valence electron than Mg

c) Na has higher melting point than K

Answer:

- Na and K are metallic structure / giant covalent structure / simple covalent molecule
- Na has stronger / weaker metallic bond because Na has smaller / larger atomic radii / ionic radii than K

d) Si has higher melting point than P

Answer:

- Si is metallic structure / giant covalent structure / simple covalent molecule
- P is metallic structure / giant covalent structure / simple covalent molecule
- Si has strong metallic bond / strong covalent bond / weak van der Waals forces
- P has strong metallic bond / strong covalent bond / weak van der Waals forces

KEYWORDS

MOLECULES

IMF	Weak van der Waals forces		Strong hydrogen bond
	London forces	Dipole-dipole forces	
Criteria	Non-polar molecule	Polar molecule	Molecule with H bonded to F, O, N
Examples	CCl_4 , CH_4 , CO_2 , Cl_2 , XeF_4	SeF_4 , BrF_5 , CH_2Cl_2	ROH , RCOOH , HF , H_2O , NH_3 , RNH_2

Explain the following observation:

a) CH_3OCH_3 has higher boiling point than $\text{CH}_3\text{CH}_2\text{OH}$

Answer:

- CH_3OCH_3 is a non-polar / polar molecule with strong hydrogen bond / weak dipole-dipole force / weak van der Waals force
- $\text{CH}_3\text{CH}_2\text{OH}$ is a non-polar / polar molecule with strong hydrogen bond / weak dipole-dipole force / weak van der Waals force
- Al has strong metallic bond / strong covalent bond / weak van der Waals forces
- Ar has strong metallic bond / strong covalent bond / weak van der Waals forces

b) CCl_4 has higher boiling point than CF_4

Answer:

- CCl_4 is a non-polar / polar molecule with strong hydrogen bond / weak van der Waals force
- CF_4 is a non-polar / polar molecule with strong hydrogen bond / weak van der Waals force
- CF_4 has a lower / higher molecular size than CCl_4 , therefore it has a weaker / stronger _____

c) H_2O has higher melting point than CH_3OH

Answer:

- H_2O is a non-polar / polar molecule with strong hydrogen bond / weak van der Waals force
- CH_3OH is a non-polar / polar molecule with strong hydrogen bond / weak van der Waals force
- H_2O forms more / less hydrogen bonding than CH_3OH